

Chapter 4. Central Coast Hydrologic Region

Setting

The Central Coast Region extends from southern San Mateo County in the north to Santa Barbara County in the south (Figure 1 is a map and table of statistics that describe the region). The region includes all of Santa Cruz, Monterey, San Luis Obispo and Santa Barbara Counties and parts of San Mateo, Santa Clara, San Benito, and Ventura Counties. Many attributes define the Central Coast region including: the topography, the multitude of microclimates, the uniqueness of agricultural production, and the picturesque coastline, valleys and communities that drive a thriving tourism economy.

Most of the Central Coast Region lies within the Coast Ranges, which stretch from the northern part of the region into San Luis Obispo and Santa Barbara Counties. The component of the Coast Ranges nearest the coast is the Santa Lucia Range, where elevations of a few peaks exceed 3,000 ft. above sea level. Inland Coast Ranges are comprised of the Gabilan and Diablo Ranges in the North, the Cholame Hills in the center, and the Temblor and La Panza Ranges in the South. The San Rafael and Sierra Madre Mountains cover nearly three-quarters of Santa Barbara County. The southernmost quarter of Santa Barbara County is occupied by the Santa Ynez Mountains, which are a component of another landform, the east-west trending Transverse Ranges. The mountains in eastern Santa Barbara County attain elevations of about 7,000 ft.

Lowlands in the Region include narrow streambeds winding to the coast, coastal terraces and plains of varying sizes, and a few larger river valleys. The largest lowland near the coast is the Salinas Valley. Although less than 10 miles wide for most of its length, it stretches for 120 miles from the community of Moss Landing on Monterey Bay southeastward to near the community of Santa Margarita in San Luis Obispo County. Pajaro Valley is a smaller coastal valley adjacent to the Salinas Valley on the north side of Monterey Bay. Another large lowland near the coast is Santa Maria Valley, which straddles the Santa Maria River. Most of this valley is in Santa Barbara County, but a portion is also in San Luis Obispo County. The Salinas and Santa Maria Valleys are the premier agricultural production areas of the Central Coast. Other significant interior lowlands include San Benito Valley in the far north, the inland Cuyama Valley shared by San Luis Obispo and Santa Barbara County, and the Lompoc and Santa Ynez Valleys in Santa Barbara County. The single largest lowland in the region is the Carrizo Plain in the eastern backcountry of San Luis Obispo County. The Carrizo Plain is really just a very wide basin on the otherwise fairly narrow but notorious San Andreas Fault Zone, which runs the length of the Region.

The Central Coast's rivers generally have a northwest-southeast alignment, reflecting the aforementioned topographic trend of the Region's mountains and hills. The Pajaro, Carmel, and Salinas Rivers drain the northern part of the region, the Estrella River and San Juan Creek drain the central portion, and the Cuyama and Santa Maria River system and the Santa Ynez River drain the southern portion. All rivers drain into the Pacific Ocean.

Climate

The climate of the Central Coast remains temperate year round because of its close proximity to the Pacific Ocean. The Central Coast has a Mediterranean climate characterized by mild, wet winters and warm, dry summers. The regional climate is dominated by a strong and persistent high-pressure system that frequently lies off the Pacific coast. The Pacific High shifts northward or southward in response to

seasonal changes or the presence of cyclonic storms. Transport of cool, humid marine air onshore by winds from the northwest causes frequent fog and low clouds near the coast, particularly during night and morning hours in the late spring and early summer months. San Benito County is the only county in the region that does not have a coastline. As a result, temperature is often higher and fog less prevalent than in the coastal counties.

January is the coolest month with average high and low temperatures of 59F and 41F respectively; while September is the warmest with 72F and 52F, respectively. The best kept secret, particularly pertaining to the North Central Coast, is that the best weather occurs in September and extends through the middle of November with a few days getting into the 80s and 90s. Summer temperatures are cool along the coastline and warmer inland. In the winter, temperatures remain cool along the coast but become cooler inland. The year-round frost-free climate of the coastal valleys makes them ideal for production of specialty crops such as strawberries and artichokes.

Annual precipitation in the region ranges from 14 to 45 inches, usually in the form of rain. Most of the rainfall occurs between late November and mid April. The average annual precipitation near the City of Salinas is about 14 inches. The southern interior basins usually receive 5 to 10 inches per year, the mountain areas receiving more than the valley floors. The vineyard growing areas in both sub-regions have summers that are long and cool being situated very close to the Pacific Ocean. High quality wine grapes thrive in this environment with very moderate climate all summer, with foggy mornings, bright sunshine from mid-day through the afternoon, and very windy afternoons and early evenings.

The Monterey Area, in general, enjoys the mildest climate with the least extremes of temperature (fewest hot and cold days) of any place in the continental United States. A prevailing feature of summertime weather is the coastal fog or stratus overcast that affects most of the area. The low overcast/fog usually burns off in the late morning and moves back in before midnight. During the winter, the coolest areas are inland away from the ocean. Winds are lightest in the winter and highest in the summer, except for occasional storm systems.

The most prominent feature in the region is the floor of the Salinas Valley, which is approximately seven miles wide at Chualar, nine miles wide at Greenfield, and four miles wide at King City. The microclimate in these coastal areas (Salinas, Pajaro, and Santa Maria Valleys) is ideal and are known for the production of lettuce, broccoli, mushrooms, strawberries, and citrus, along with numerous other crops. The microclimate in these coastal areas is also ideal for the floral industry and grape vineyards, planted by world-famous vintners.

At the very southern end of the region is Santa Barbara County. Summers are warm and dry; the winters are cool and often wet. The county has a unique physical orientation, with a series of east-west transverse mountain ranges. This produces a profound orographic effect when a storm approaches the county from the Pacific Ocean. Most precipitation occurs between November and March. For the most part, Santa Barbara County receives relatively gentle but steady rainfall during storm events. Moist air from the Pacific Ocean moderates temperatures in the coastal areas; somewhat lower winter minimums and higher summer maximums prevail in the inland valleys.

Population

The population of the Central Coast Region was approximately 1,456,000 in 2000 slightly more than 4 percent California's total population. About 65 percent of the Central Coast population resided in incorporated cities. The big cities of the region are Salinas (143,800), Santa Barbara (89,600), Santa Maria (77,400), Santa Cruz (54,600), San Luis Obispo (44,200), Lompoc (41,100), Watsonville (44,300), Hollister (34,400), Monterey (29,700), Atascadero (26,400), and El Paso de Robles (24,300). There are several cities in the region with populations of less than 20,000.

California experienced a population increase approaching 15 percent from 1990 to 2000, while the growth in Central Coast region was slightly less than 13 percent. Most of the counties in the Central Coast region reached double digit population growth rates over this ten year period. The only county with a growth rate below double digits, according to Department of Finance population statistics, was Santa Barbara County which grew by only 8 percent. San Benito County far exceeded all other counties recording a 45 percent increase during the decade. The population growth rates for Monterey County, San Luis Obispo County and Santa Cruz County were 13 percent, 14 percent, and 11 percent, respectively.

Population growth in the region is largely constrained by land use policy, which limits housing supply. The cost of homes in most of the region is well above the national average, with the mostly costly real estate occurring in the proximity to the Santa Cruz and Monterey Bays, Santa Barbara and greater Salinas area. As with most communities facing extremely high real estate prices, there is a lack of entry and mid level housing. Prices have been driven upward due to lack of development coupled with high demand from many people from the Los Angeles and San Francisco areas. The high cost of housing in the City of Santa Barbara is resulting in a 'flight to affordability', as increasing numbers of workers are commuting into Santa Barbara daily from Santa Maria and the Santa Ynez Valley. Likewise, workers commute from/to Salinas, Hollister and some locations in the San Joaquin Valley, such as Tracy, Los Banos, Patterson, and Modesto.

Land Use

The busy topography of the Central Coast Region and distance from California's major population centers have resulted in a landscape that is primarily pastoral and agricultural. Major economic activities include tourism, agricultural-related processing, as well as government and service sector employment. Oil production and transportation sites onshore and offshore are important to the economy.

Cities in the region are predominantly located on bays and terraces along the coast, but some are located in the interior Salinas and Santa Ynez River Valleys. Most of the other interior valleys in the region support only small population clusters among scattered rural residents.

In general, the Central Coast's agriculture has two major components; one is irrigated vegetable and specialty crops grown on coastal terraces and valleys and in some inland valleys, and the other is range pasture and dry-farmed grain in the inland valleys. Wine grape acreage has expanded vigorously in the Central Coast in recent years and represents the region's highest value individual agricultural commodity. Vineyard acreage region-wide grew 36 percent between 1998 and 2001. Although wine grapes are the highest value individual agricultural commodity in the region, vegetable crops as a group are even more valuable. Livestock operations, mainly cattle, are also significant in the region.

Total irrigated agricultural land acreage in the Central Coast Region has only slightly increased from 406,700 acres in 1990 to 424,500 acres in 2000 (4.4 percent). Total crop acreage increased from 503,200 acres in 1990 to 589,600 acres in 2000, a 17.2 percent increase. Total agricultural land acreage has not changed significantly, but total crop acreage has increased due to an increase in the multiple cropping of vegetables.

Acreage of field crops has been declining for quite a few years. It is rare to find any sugar beets grown in the region and the two processing plants in Spreckles and Santa Maria that used to take delivery of local sugar beets have both closed. Other field crops that have seen significant declines are corn, alfalfa, and irrigated pasture. The acreage of truck crops has increased dramatically. Lettuce acreage has seen a tremendous increase in total acreage. In 1990, the reported acreage of lettuce by the Monterey County Agricultural Commissioner's office was 58,000 acres, and in 2000, it was 106,000 acres. Value added products such as packaged salads, baby lettuce mixes, and specialty bag mixes have created a large demand for the many types of lettuce grown in the region, as well as for specialty greens.

The two premier vegetable-growing centers in the region are the amazingly productive Salinas Valley in the north and the smaller Santa Maria Valley in the south. Year-round multiple cropping is the rule in these areas. The results from a multiple cropping field study conducted by the Department of Water Resources in the Salinas Valley in 1997 indicated that over 100,000 acres of land was multiple cropped, which is about 40 percent of the irrigated land in the Northern sub-region.

The entire region was home in 2001 to over 200,000 acres of land devoted to the production of irrigated vegetables and specialty crops, and produced, through multiple cropping, over 300,000 acres of specialty crop product. From 1992 to 1998, the Region lost over 14,400 acres of agricultural land to urban uses (CA Dept. of Conservation figures). However, growers have compensated for the agricultural land losses by increased multiple cropping and the use of non-irrigated pasture lands.

Citrus and subtropical fruit crops, chiefly avocados and some lemons, are grown on nearly 16,000 acres in the region, predominantly in the South. More than three-quarters of the acreage are located around Santa Barbara. Nearly 5,500 acres of irrigated deciduous fruit trees, mostly walnuts, are grown in the region, too, largely in San Luis Obispo County. About 60 percent of the vineyard acreage is in the northern part of the region; however, the acreage grew from about 14,000 to 27,500 acres in the southern part from 1998 to 2001. Total grape acreage in the region expanded from 46,000 to 67,500 acres between 1998 and 2001. Wineries with wine-tasting rooms have become an important component of the region's travel and tourism industry.

Publicly-owned lands, including military reservations, federally-managed areas, and parks, constitute about 28 percent of the Central Coast's total area. The main environmental water use is for the Salinas River National Wildlife Refuge, which is on 366 acres where the Salinas River empties into Monterey Bay.

The Refuge is part of the San Francisco Bay National Wildlife Refuge Complex, which has its headquarters in Fremont, California. Refuge lands include a range of terrestrial and aquatic habitats, including coastal dunes and beach, grasslands, wetlands, and riparian scrub. Because it is within the Pacific Flyway, the Refuge is used by a variety of migratory birds during breeding, wintering, and migrating periods. It also provides habitat for several threatened and endangered species.

Water Supply and Use

Groundwater is the primary source of water supply in the region, accounting for 84 percent of the annual supply in 2000. Local surface water supplies are a distant second. Furthermore, groundwater recharge is provided by the Pajaro, Salinas, and Carmel Rivers, and by the Arroyo Seco. Also, water impounded in local reservoirs is managed to provide groundwater recharge. San Clemente and Los Padres Dams on the Carmel River (Monterey County), San Antonio Dam on the San Antonio River (Monterey County), and Nacimiento Dam on the Nacimiento River (San Luis Obispo County) are the region's main surface water storage facilities.

Water agencies in the northern sub-region include Monterey County Water Resources Agency, Monterey Peninsula Water Management District, Marina Coast Water District, California-American Water Company, California Water Service Company, Sunnyslope County Water District, Pajaro Valley Water Management Agency, City of Santa Cruz, and San Benito County Flood Control and Water Conservation District. Water agencies in the southern sub-region include the San Luis Obispo County Flood Control and Water Conservation District and the Santa Barbara County Flood Control and Water Conservation District and numerous cities, special (water) districts, community services districts, and public utility companies. The Central Coast Water Authority includes many of these water entities.

Virtually all applied irrigation water was groundwater until water from the CVP's San Felipe Project was introduced in June 1987. The CVP's contracts for deliveries to the Santa Clara Valley Water District and the San Benito County Water District through the San Luis Reservoir total 196,300 af/yr (138,250 af/yr for M&I and 58,050 af/yr for Ag). There are two other USBR projects in the region. The Cachuma Project provides Santa Ynez River water to the communities of Carpinteria, Goleta, Montecito, Santa Barbara and Santa Ynez from the 190 taf Cachuma Reservoir (Bradbury Dam) through the Tecolote Tunnel and South Coast Conduit. Another federal reservoir, the USACE's 26 taf Santa Margarita Lake (Salinas Dam) provides a water supply for the City of San Luis Obispo. Imported supplies also come into the region via the SWP's Coastal Branch Aqueduct, which delivers 70.5 taf/yr into San Luis Obispo and Santa Barbara Counties.

The California-American Water Company, which is the primary water supplier to most of the Monterey Peninsula, diverts water from the San Clemente Dam on the Carmel River, the company's primary source of water. The 67-foot-high San Clemente Dam was built 15 miles from the mouth of the Carmel River in 1921. San Clemente was originally designed to hold up to 2,260 acre-feet of water, but over the years the dam storage capacity has been reduced by sediment transported from upstream. Furthermore, forest fires over the years created heavy erosion that added to the silt, and so much is impounded behind the dam that it now can hold only 125 acre-feet of water or about 5.5 percent of its original capacity. When and where Cal-Am takes water from the Carmel River is tightly regulated and local agencies and groups have been attempting for years to formulate a plan to bring some stability to the local water supply.

The City of Santa Cruz meets some of its water supply demands with surface water from three sources: Loch Lomond, the San Lorenzo River, and from Coastal sources. The City of Watsonville diverts and treats surface water supplies from the Corralitos and Brown Creeks.

Desalination of seawater is another source of supply available in this region. There are 7 existing seawater desalting plants along the central coast. Of these, only 1, Marina Coast Water District, is in continuous

use to provide municipal water for the California mainland. The other 8 provide water for offshore islands or for industrial use. In the Central Coast Region, an additional 4 seawater desalting plants of greater than 1 million gallons per day in capacity are in various stages of planning. These four plants will total about 19.2 mgd, or about 20,000 acre-ft per year. The plants under consideration include Santa Cruz (2.5 mgd), Monterey (Moss Landing, 9 mgd), Marina (2.7 mgd expansion to 300 mgd total), and Morro Bay (5 mgd private development). There are additional smaller plants also being considered in the Monterey and Cambria area.

The 1987-92 drought resulted in the construction of several seawater desalting plants in the region. The City of Santa Barbara constructed an 8 mgd plant that was to provide water during periods of water shortage. The plant is inactive and most, if not all, its equipment has been removed. A small plant was constructed for the Department of Parks and Recreation at the San Simeon Beach State Park to serve the Hearst Castle Visitor's Center. That plant was removed when a firm surface water supply was acquired. The City of Morro Bay constructed a plant and operates it intermittently during water short periods. The Marina Coast Water District constructed and operates a seawater desalting plant continuously as part of their regular water supply.

Water recycling is becoming a more important resource for water purveyors in the region. For example, Santa Barbara County has three wastewater treatment plants that recycle wastewater for reuse in the community for toilet flushing, agricultural and landscape irrigation, and dust control and compaction at construction sites. These communities expect to increase the amounts of recycled water used in the future. In addition, Laguna Sanitation District is currently designing wastewater treatment and recycled water distribution facilities that will be used to serve a golf course and several other irrigation water customers within the City of Santa Maria.

Agriculture is the main user of water supplies in the region, accounting for 64 percent of the region's total water use, while environmental water use was 16 percent and urban water use was 20 percent. Per capita water use in many parts of the Region remains at or below that of the late 1980s. The noticeably sharp decline could be traced to the aggressive implementation of water use efficiency programs and mandatory reductions in use during the 1987-1992 drought. The City of Santa Barbara is good example of this. Shortages from one of its sources of supply, the Cachuma Project, forced the City to intensify its conservation/rationing program activities and implement mandatory cutbacks for its customers. In 1988, the average daily per capita water use for the City was estimated at 164 gallons. That value dropped to 94 gallons in 1990. For 2000, the estimated value was 133 gallons per day.

The following water balance table summarizes the detailed regional water accounting contained in the water portfolio at the end of this regional description. As shown in the table, groundwater makes up a substantial portion of the water supply in the region. The data seem to show that the surface water supply and accompanying water uses are out of balance. This is indicated by the negative groundwater use values for each of the three years. See Table 4-1, Central Cost Hydrological Region Water Balance Summary.

State of the Region

Challenges

With the Central Coast's limited surface supply and few surface water storage facilities, the growing demand for water is causing an increased dependence on the region's groundwater resources. Because groundwater extractions have exceeded groundwater replenishment, seawater has advanced into some coastal freshwater aquifers, degrading water quality. Fortunately, there are some locations within the region, such as the Seaside Groundwater Basin and the Carmel River Groundwater Basin located within the Monterey Peninsula Water Management District, where rigorous monitoring and management practices limit well production to within the safe yield of the basins, averting a seawater intrusion problem.

While groundwater quality throughout the region is generally suitable for most urban and agricultural uses, some areas experience water quality problems, including erosion and sedimentation, industrial waste discharges, nutrients and pathogens, pesticides, urban runoff, as well as seawater intrusion.

Natural resource-rich areas such as Morro Bay, Monterey Bay and parts of the Salinas Valley are the focus of water quality issues in this region. Sedimentation poses the greatest water quality threat to Morro Bay, one of 28 estuaries in the National Estuary Program. The Bay is also contaminated by pathogens (from agriculture, boats, and urban runoff), nutrients (due to fertilizers, animal wastes, and urban runoff), and heavy metals contaminating sediments (from abandoned mines in the upper watershed, as well as boat yards offshore). Elevated levels of bacteria have closed many of the shellfish growing beds in Morro Bay, and have also frequently closed beaches in Santa Cruz County and southern Santa Barbara County. To protect special areas of biological significance, waste discharges are prohibited or limited in portions of Monterey Bay and other specific coastal and ocean waters of the region. In its triennial review, the Central Coast Regional Board also identified the need to incorporate new microbiological standards for water contact recreation.

The main tributary to Monterey Bay, the Salinas River watershed, primarily faces nitrate and pesticide contamination related to agriculture, the valley's main land use. Groundwater overdraft is also a problem in the area. Seawater intrudes up to six miles inland in the shallow aquifer around Castroville.

The nearby Pajaro River watershed faces a variety of water quality threats, such as erosion (primarily from agricultural practices), urban runoff, sand and gravel mining, flood control projects, off-road vehicles, and historical mercury mining in the Hernandez Lake area. Wetlands in Elkhorn Slough, which is sandwiched between the Salinas and Pajaro and a tributary to Monterey Bay, suffer from erosion from strawberry and other cropped lands in its watershed. Elevated bacterial levels in the Slough may be associated with a large dairy and waste operation, and the over 600 year-round vessels—and their wastes—in the Moss Landing Harbor. Taken together with the re-suspension of pesticides in sediment, these pollutants have restricted shellfish growing in Elkhorn Slough.

Beyond the Salinas Valley, water quality problems (salinity, nutrients, etc.) impact other watersheds and groundwater basins in the region. Groundwater basins that are impacted by salinity include the Hollister, the Carrizo Plain, the Santa Maria and Cuyama Valleys, San Antonio Creek Valley, portions of the Santa Ynez Valley, and the Goleta and Santa Barbara. Nutrients and pathogens impact the San Lorenzo River

basin, from septic systems, horse corrals, and urban runoff, as well as erosion from logging, urban development, and road maintenance.

The California-American Water Company is the primary water supplier to most of the Monterey Peninsula, and the Carmel River is its primary source of water. In 1995, the State Water Resources Control Board ruled the company did not have a legal right to about 70 percent of the water it takes from the Carmel River. Cal-Am has been forced to take more water from wells that draw from groundwater below the lower valley, keeping as much water as possible in the river. Relatively little is now taken from the river's two reservoirs behind the San Clemente and Los Padres dams. Now Cal-Am and the Monterey Peninsula Water Management District both have made separate proposals for seawater desalination plants to produce enough water to satisfy the state order — and put about 8,000 acre-feet of water a year back into the Carmel. Neither project as currently proposed will supply any water for future growth, or for in-fill housing.

Accomplishments

Many water districts have ongoing programs to evaluate, understand, and better manage their groundwater resources. Many watershed programs are underway to reduce non-point pollution, reduce stream erosion, and improve riparian vegetation. For example, the Coastal Watershed Council was formed in response to the declining health of the watersheds of the Monterey Bay region. Their mission is to restore the watersheds of the region and teach its residents how to become stewards of their local creeks and streams.

The Carmel River Basin, though small compared to other watersheds, supports a key run of steelhead, a federally listed species. The MPWMD conducts an extensive mitigation program to offset the environmental impacts of diversion from the Carmel River that are required to meet the peninsula's water needs. Activities include steelhead rescues from the drying river, fish rearing and release, riparian habitat restoration, and river bank protection. MPWMD works cooperatively with entities such as the Carmel River Steelhead Association and the Carmel River Watershed Council.

In January 2003, Pajaro Valley water officials, made a \$25 million deal for water to be piped from the Central San Joaquin Valley's Broadview Water District near the City of Firebaugh in Fresno County. Because of drainage and economic problems, Broadview district farmers have allowed about one-third of their 9,100 acres to lay fallow in recent years, while selling part of their CVP water deliveries. The agreement, which is part of the Pajaro Valley Water Management Agency's plan to use imported water to halt over-pumping and, thus, seawater intrusion, will help northern Monterey County growers who raise crops on thousands of acres in the Pajaro Valley. After obtaining the approval of the United States Bureau of Reclamation, the Pajaro Valley WMA will get the rights to 27,000 acre-feet of water a year from the Central Valley Project. The deal marks the second purchase of CVP water rights by the Pajaro Valley agency. In 1999, it acquired 6,250 acre-feet from the Mercy Springs Water District, also in the Central San Joaquin Valley. The district plans to build a 23-mile pipeline from Gilroy to Watsonville to deliver the Broadview CVP water. Construction is scheduled to start in 2004, when the Broadview water deal is made final.

In 1998, the Monterey County Water Resources Agency and the Monterey Regional Water Pollution Control Agency (RWPCA) jointly completed a \$78 million Salinas Valley reclamation project and Castroville seawater intrusion project. These projects consist of a 19,500 acre-feet per year tertiary

treatment plant and a distribution system that provides about 13,000 acre-feet of recycled water to 12,000 acres of Castroville area farms. During the low irrigation demand periods in winter, early spring and late fall, recycled water supplies most of the water needed for irrigation. The projects will reduce groundwater pumping in the project area, thus reducing seawater intrusion. Another project that will help alleviate the Salinas Valley's seawater intrusion problem is the \$18.8 million Salinas Valley Water Project. The project is a two-pronged approach that includes: (1) a seasonal rubber dam on the Salinas River near Marina to deliver more fresh water to saltwater-plagued areas near Castroville and (2) the modification of operations at Lakes San Antonio and Nacimiento to provide higher summer flows to recharge Salinas Valley aquifers. Implementation was underway at the time this report was prepared.

Relationship with Other Regions

The region receives imported CVP water from the San Joaquin River Region and imported SWP water from the Tulare Lake Region.

Looking to the future

Local water agencies in the Central Coast Region are continually maintaining, servicing, expanding, and updating their water systems. Because groundwater is the primary water source for the Central Coast Region, in addition to implementing water conservation programs, water agencies are combining groundwater and surface water components into conjunctive use projects. Some common water management techniques being considered are recycling, groundwater recovery, and water marketing.

Ongoing Planning Efforts

- Salinas Valley Water Plan
- Pajaro Valley Groundwater Management Plan
- Pajaro River Watershed Council
- Coastal Watershed Council
- Upper Salinas River Watershed CRMP
- Carmel River Watershed Council
- Carmel River Management Plan
- Seaside Basin Groundwater Management Plan

Regional Planning

Several water agencies (e.g., Marina Coast Water District and Scotts Valley Water District) are developing groundwater management plans and conducting groundwater studies to fill in information gaps about local groundwater conditions.

In its ongoing effort to implement their Basin Management Plan (BMP) Alternative B, Pajaro Valley Water Management Agency (PVWMA) has purchased rights to CVP water supplies from Broadview WD (27,000 af) and Mercy Springs WD (6,250 af), began pipeline construction to deliver Harkins Slough Project and supplemental well water to coastal growers whose wells have been contaminated by seawater, and is pursuing more than \$50 million in state and federal grants to implement the BMP. The BMP includes new wells, as a supplemental supply and as a source of blend water for wastewater reclamation, and an injection/recovery program for Central Valley Project water. The Monterey Peninsula Water Management District (MPWMD) has carried out a multi-year aquifer storage and recovery test program, where excess winter flow from the Carmel River is treated and injected into the Seaside Basin for recovery during dry periods. MPWMD has also funded several hydrogeologic studies of the Seaside Basin, and is in the early phases of developing a Seaside Basin Groundwater Management Plan. The PVWMA is also pursuing new supplemental wells as a source of blend water for the wastewater

reclamation component, as a supplemental supply for the coastal distribution system, and as a supplemental supply to the import project during periods of shortage. Injection of Central Valley Project water is also being considered as part of the import project component. Injection well success depends on the quality of the water injected.

Insert info from Brian on planned projects here - Many projects and studies are underway in the Central Coast Region to enhance water quality and supply. Several new ocean desalination plants, such as the desalination project in the San City area being studied by Monterey Peninsula Water Management District, are being investigated as potential sources of new water supplies. Many agencies are also considering recycled water projects in conjunction with the construction of new or expanded municipal wastewater treatment plants. Local water users are proposing to raise the height of USBR's Bradbury Dam (Cachuma Reservoir) up to 3 feet to provide more water supply for the enhancement of downstream fish habitat. And many watershed programs are underway to remediate pollution and sedimentation, to help flood control, and to protect and restore ecosystems.

Water Portfolios for Water Years 1998, 2000, and 2001

Water Portfolio for Water Year 1998

California experienced another year of El Nino weather patterns in 1998 (July 1997-June 1998). Because of the extensive damage caused by El Nino, the storm event ranked as the tenth costliest in California recorded history. Particularly hard hit were the coastal valleys of the Northern sub-region, where many agricultural fields remained wet for the entire first half of 1998.

In the North Central Coastal sub-region, water year precipitation in the Santa Cruz area exceeded 30 inches (193.5 percent of normal), while in the south Central Coastal sub-region, the Santa Barbara NWS station measured almost 47 inches of rainfall (167 percent of normal).

Total agricultural production in the region was \$3.65 billion (Monterey, Santa Cruz, San Benito, San Luis Obispo, and Santa Barbara Counties) in 1998 from 564,600 acres of harvested irrigated crops. This is only a modest increase over 1997, but it is significant considering some of the challenges that the agricultural industry faced. Most of the farming along the Central Coast involves the production of truck crops. Total truck crop acreage accounted for 72 percent of all irrigated crop acreage. The next largest crop is vineyard comprising 12 percent of irrigated crop acreage. The Salinas Valley area produces the majority of the spring and summer truck crops, particularly lettuce.

The El Nino phenomenon had such an impact on the Central Coast Region's volume of precipitation that growers in most cases had little need to irrigate during the first 4 to 5 months of 1998. The very wet conditions prevented the timely planting of many acres of truck crops. Spring rains delayed planting and negatively affected growing conditions, especially impacting head lettuce production. There was also a decrease in wine grape value due primarily to the wet cool conditions while acreage continued to increase. Strawberry acreage was slightly less than 1997 but total value rose due to the shortage early in the season, resulting in higher prices once the berries were harvested. The most significant increase in 1998 was attributed to salad products, which were up about \$70 million as consumer demand grew. Head lettuce value significantly dropped primarily as a result of wet spring conditions.

The 1998 total agricultural applied water in the Central Coast Region was 822,700 AF (57% of total regional applied water). Average agricultural applied water per acre in 1998 was 1.5 af/ac. The total agricultural ETAW in 1998 was 595,100 AF. The 1998 regional average ETAW was 1.1 af/ac.

Total urban applied water (including residential, commercial, industrial, and landscape) in the region was 276,500 AF. Average per capita water use was about 176 gallons per day. Urban water use accounts for about 19 percent of the total water use in the region. Urban ETAW was 91,600 AF. In 1998 the population for the region was around 1,420,400.

Total environmental demand (instream, wild & scenic, and refuges) for the region was about 339,000 AF. This accounts for 23 percent of total uses. This is water that is reserved for instream and wild & scenic river flow, but that can be later used as a supply by downstream users.

Total supplies, including local and imported (CVP & SWP) surface water, groundwater, and reuse, amounted to 1.5 maf

See Tables 4-2 and 4-3 and Figure 4-2.

Water Portfolio for Water Year 2000

The weather of water year 1999-2000 in the Central Coast Region was very close to typical. Rainfall amounts decreased in a southerly direction with Santa Cruz precipitation at about 118 percent of average (36.4 inches), Salinas at about 110 percent of average (16.5 inches), Santa Maria at about 113 percent of average (14.6 inches) and Santa Barbara at about 121 percent of average (21.3 inches).

Water conditions in the Central Coast Region watersheds were reported above normal. Average reservoir storage on May 1 was 115 percent of normal with runoff to May 1 measured at 105 percent of normal. The land acreage used for irrigated agricultural continued the past trend of remaining relatively stable. Crop acreage, however, increased seven percent from 1998 to 2000 within the region to 605,200. However, the estimated amount of multiple cropping in 2000 increased 13 percent and is reflected in the increased acreage of truck crops of seven percent from 1998. Truck crops comprised about 72 percent of total crop acreage with the next largest crop category, vineyard, comprised to 15 percent.

The 2000 total agricultural applied water in the Central Coast Region was 994,800 AF (64% of total regional applied water). This amounts to 21 percent more applied water than was estimated in 1998. Average agricultural applied water per acre in 2000 was 1.6 compared to 1.5 af/ac. in 1998. The total estimated 2000 agricultural ETAW was about 710,000 AF (19% higher than 1998). The regional average ETAW in 2000 was 1.2 af/ac.

In 2000, total urban applied water for the region was 308,500 af, which was 12 percent higher than the total applied water for 1998. Average per capita water use was about 183 gallons per day. Urban applied water accounts for about 19 percent of the total water use in the region. Total population in the region for the 2000, was around 1,456,118, an increase of about 2.5 percent over the 1998 population. Total ETAW for the year was about 102,200 af.

Total environmental demand (instream, wild & scenic, and refuges) for the region was about 260,300 AF. This accounts for 16 percent of total uses. This is water that is reserved for instream and wild & scenic river flow, but that can be later used as a supply by downstream users.

Total supplies, including local and imported (CVP & SWP) surface water, groundwater, and reuse, amounted to 1.6 maf

Water Portfolio for Water Year 2001

The weather of water year 2000-2001 in the Central Coast Region was below average. Rainfall amounts recorded in Santa Cruz was 82 percent of average (25.4 inches), Salinas at about 90 percent of average (13.5 inches), King City at about 116 percent of average (12.8 inches) and Santa Barbara at about 146 of average (23.5 inches). Rainfall was scarce October through December.

Surface water conditions in the Central Coast Region watersheds were reported below average. Reservoir storage on May 1 was 135 percent of average; however, watershed runoff to May 1 measured at 70 percent of average. Crop acreage in 2001 increased seven percent from 1998, but decreased less than one percent from 2000. The total irrigated crop acreage was 605,200. In 2000 the prices of many of the core crops grown in the region experienced significant increases. However, in 2001, many of these same crops experienced production as well as price declines. Head lettuce, broccoli, cauliflower, and celery production all experienced decreases.

The 2001 total agricultural applied water in the Central Coast Region was 1,146,400 AF (75% of regional applied water). This amounts to 39 percent more than 1998 and 15 percent more than 2000. Average applied water per acre in 2001 was 1.9 af/ac compared to 1.5 af/ac. in 1998 and 1.6 in 2000. The 2001 total estimated agricultural ETAW was 803,400 AF or 35 percent higher than 1998 and 13 percent higher than 2000. The regional average 2001 ETAW was 1.3 af/ac.

In 2001, total urban applied water for the region was 287,500 af, which was 4% more than 1998 but 7 percent less than 2000. Average per capita water use was around 192 gallons per day. Urban water use accounted for about 19 percent of the total water use in the region. Total population in the region for the 2001, was about 1,476,899 (an increase of 1.5 percent in comparison to the 2000 population). Total ETAW for the year was around 94,400 AF.

Total environmental demand (instream, wild & scenic, and refuges) for the region was about 84,800 AF. This accounts for 6 percent of total uses. This is water that is reserved for instream and wild & scenic river flow, but that can be later used as a supply by downstream users.

Total supplies, including local and imported (CVP & SWP) surface water, groundwater, and reuse, amounted to 1.5 maf

Sources of Information

- Water Quality Control Plan, Regional Water Quality Control Board
- Watershed Management Initiative Chapter, Regional Water Quality Control Board
- 2002 California 305(b) Report on Water Quality, State Water Resources Control Board
- Bulletin 118 (Draft), California's Groundwater, Update 2003, Department of Water Resources
- Nonpoint Source Program Strategy and Implementation Plan, 1998-2013, State Water Resources Control Board, California Coastal Commission, January 2000
- Strategic Plan, State Water Resources Control Board, Regional Water Quality Control Boards, November 15, 2001
- The Californian, Salinas CA
- San Luis Obispo County Tribune
- Monterey County Herald

Figure 4-1
Central Coast Hydrologic Region

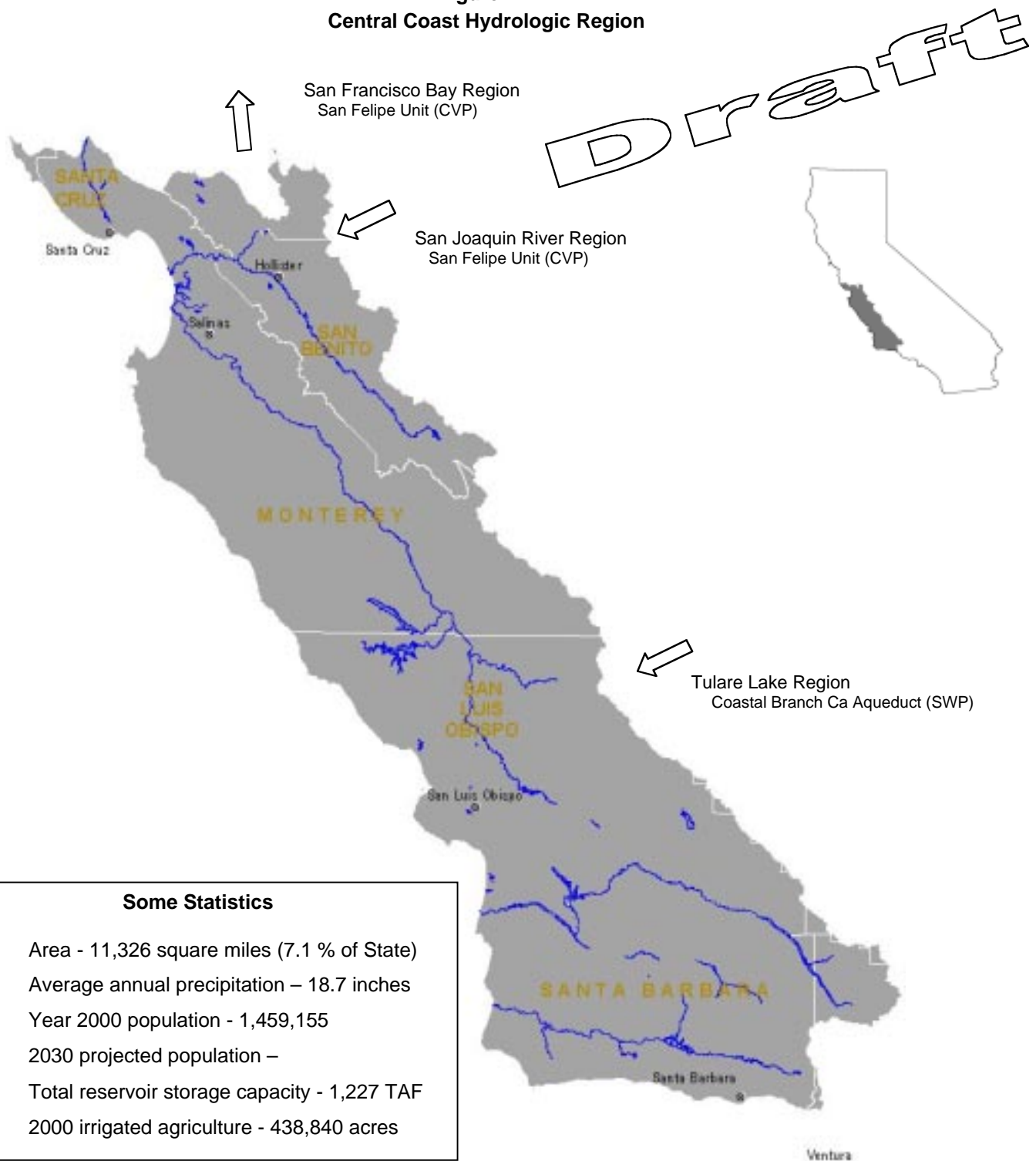


Table 4-1
Central Coast Hydrologic Region Water Balance Summary – TAF

Water Entering the Region – Water Leaving the Region = Storage Changes in Region

	1998 (wet)	2000 (average)	2001 (dry)
Water Entering the Region			
Precipitation	25,202	12,596	11,848
Inflow from Oregon/Mexico	0	0	0
Inflow from Colorado River	0	0	0
Imports from Other Regions	108	144	180
Total	25,310	12,740	12,028
Water Leaving the Region			
Consumptive Use of Applied Water * (Ag, M&I, Wetlands)	673	798	884
Outflow to Oregon/Nevada/Mexico	0	0	0
Exports to Other Regions	66	89	133
Statutory Required Outflow to Salt Sink	174	95	49
Additional Outflow to Salt Sink	130	153	156
Evaporation, Evapotranspiration of Native Vegetation, Groundwater Subsurface Outflows, Natural and Incidental Runoff, Ag Effective Precipitation & Other Outflows	24,505	12,364	11,689
Total	25,548	13,499	12,911
Storage Changes in the Region			
[+] Water added to storage			
[-] Water removed from storage			
Change in Surface Reservoir Storage	401	8	-14
Change in Groundwater Storage **	-639	-767	-869
Total	-238	-759	-883

Applied Water * (compare with Consumptive Use)			
	1,099	1,303	1,434
* Definition - Consumptive use is the amount of applied water used and no longer available as a source of supply. Applied water is greater than consumptive use because it includes consumptive use, reuse, and outflows.			

**Footnote for change in Groundwater Storage

Change in Groundwater Storage is based upon best available information. Basins in the north part of the State (North Coast, San Francisco, Sacramento River and North Lahontan Regions and parts of Central Coast and San Joaquin River Regions) have been modeled – spring 1997 to spring 1998 for the 1998 water year and spring 1999 to spring 2000 for the 2000 water year. All other regions and year 2001 were calculated using the following equation:

GW change in storage =

intentional recharge + deep percolation of applied water + conveyance deep percolation - withdrawals

This equation does not include the unknown factors such as natural recharge and subsurface inflow and outflow.

Table 4-2
Water Portfolios for Water Years 1998, 2000 and 2001

Category		Description	Central Coast 1998 (TAF)				Central Coast 2000 (TAF)				Central Coast 2001 (TAF)				Data
Inputs:			Water Portfolio	Applied Water	Net Water	Depletion	Water Portfolio	Applied Water	Net Water	Depletion	Water Portfolio	Applied Water	Net Water	Depletion	Detail
1		Colorado River Deliveries		-				-				-			PSA/DAU
2		Total Desalination		-				-				-			PSA/DAU
3		Water from Refineries		-				-				-			PSA/DAU
4a		Inflow From Oregon		-				-				-			PSA/DAU
b		Inflow From Mexico		-				-				-			PSA/DAU
5		Precipitation	25,201.6				12,596.4				11,847.9				REGION
6a		Runoff - Natural	N/A				N/A				N/A				REGION
b		Runoff - Incidental	N/A				N/A				N/A				REGION
7		Total Groundwater Natural Recharge	N/A				N/A				N/A				REGION
8		Groundwater Subsurface Inflow	N/A				N/A				N/A				REGION
9		Local Deliveries		73.1				50.4				45.4			PSA/DAU
10		Local Imports		-				-				-			PSA/DAU
11a		Central Valley Project :: Base Deliveries		0.5				27.3				35.5			PSA/DAU
b		Central Valley Project :: Project Deliveries		17.6				23.9				19.6			PSA/DAU
12		Other Federal Deliveries		54.1				61.4				54.6			PSA/DAU
13		State Water Project Deliveries		24.6				30.9				27.7			PSA/DAU
14a		Water Transfers - Regional		-				-				-			PSA/DAU
b		Water Transfers - Imported		-				-				-			PSA/DAU
15a		Releases for Delta Outflow - CVP		-				-				-			REGION
b		Releases for Delta Outflow - SWP		-				-				-			REGION
c		Instream Flow		20.3				21.4				10.8			REGION
16		Environmental Water Account Releases		-				-				-			PSA/DAU
17a		Conveyance Return Flows to Developed Supply - Urban		-				-				-			PSA/DAU
b		Conveyance Return Flows to Developed Supply - Ag		-				-				-			PSA/DAU
c		Conveyance Return Flows to Developed Supply - Managed Wetlands		-				-				-			PSA/DAU
18a		Conveyance Seepage - Urban		-				-				-			PSA/DAU
b		Conveyance Seepage - Ag		-				-				-			PSA/DAU
c		Conveyance Seepage - Managed Wetlands		-				-				-			PSA/DAU
19a		Recycled Water - Agriculture		-				-				-			PSA/DAU
b		Recycled Water - Urban		17.5				18.5				18.5			PSA/DAU
c		Recycled Water - Groundwater		-				-				-			PSA/DAU
20a		Return Flow to Developed Supply - Ag		-				-				-			PSA/DAU
b		Return Flow to Developed Supply - Wetlands		-				-				-			PSA/DAU
c		Return Flow to Developed Supply - Urban		23.4				26.4				32.6			PSA/DAU
21a		Deep Percolation of Applied Water - Ag		212.1				254.2				288.8			PSA/DAU
b		Deep Percolation of Applied Water - Wetlands		-				-				-			PSA/DAU
c		Deep Percolation of Applied Water - Urban		53.0				62.6				64.4			PSA/DAU
22a		Reuse of Return Flows within Region - Ag		-				-				-			PSA/DAU
b		Reuse of Return Flows within Region - Wetlands, Instream, W&S		165.4				29.9				36.2			PSA/DAU
24a		Return Flow for Delta Outflow - Ag		-				-				-			PSA/DAU
b		Return Flow for Delta Outflow - Wetlands, Instream, W&S		-				-				-			PSA/DAU
c		Return Flow for Delta Outflow - Urban Wastewater		-				-				-			PSA/DAU
25		Direct Diversions	N/A				N/A				N/A				PSA/DAU
26		Surface Water in Storage - Beg of Yr	589.1				770.2				778.5				PSA/DAU
27		Groundwater Extractions - Banked	-				-				-				PSA/DAU
28		Groundwater Extractions - Adjudicated	-				-				-				PSA/DAU
29		Groundwater Extractions - Unadjudicated	905.1				1,085.3				1,222.9				REGION
Withdrawals: In Thousand Acre-feet															
23		Groundwater Subsurface Outflow	N/A				N/A				N/A				REGION
30		Surface Water Storage - End of Yr	990.1				778.5				764.5				PSA/DAU
31		Groundwater Recharge-Contract Banking		-				-				-			PSA/DAU
32		Groundwater Recharge-Adjudicated Basins		-				-				-			PSA/DAU
33		Groundwater Recharge-Unadjudicated Basins		-				-				-			REGION
34a		Evaporation and Evapotranspiration from Native Vegetation				N/A				N/A				N/A	REGION
b		Evaporation and Evapotranspiration from Unirrigated Ag				N/A				N/A				N/A	REGION
35a		Evaporation from Lakes				10.0				11.6				10.9	REGION
b		Evaporation from Reservoirs				74.2				75.9				71.5	REGION
36		Ag Effective Precipitation on Irrigated Lands	167.8					-				-			REGION
37		Agricultural Use	822.7	610.6	616.4		994.8	740.6	744.4		1,146.4	857.6	843.2		PSA/DAU
38		Wetlands Use	0.1	0.1	0.1		0.1	0.1	0.1		0.1	0.1	0.1		PSA/DAU
39a		Urban Residential Use - Single Family - Interior		55.5				70.0				69.9			PSA/DAU
b		Urban Residential Use - Single Family - Exterior		69.9				77.8				72.8			PSA/DAU
c		Urban Residential Use - Multi-family - Interior		33.1				36.9				32.7			PSA/DAU
d		Urban Residential Use - Multi-family - Exterior		17.3				20.4				17.0			PSA/DAU
40		Urban Commercial Use		48.4				54.0				46.3			PSA/DAU
41		Urban Industrial Use		26.0				22.5				20.9			PSA/DAU
42		Urban Large Landscape		12.0				12.6				13.6			PSA/DAU
43		Urban Energy Production		14.3				14.3				14.3			PSA/DAU
44		Instream Flow		20.3	-	-		21.4	-	-		10.8	-	-	PSA/DAU
45		Required Delta Outflow		-				-				-			PSA/DAU
46		Wild & Scenic Rivers Use	318.6	173.5	173.5		103.2	94.7	94.7		73.9	48.5	48.5		PSA/DAU
47a		Evapotranspiration of Applied Water - Ag		-		580.8		-		695.7		-		789.1	PSA/DAU
b		Evapotranspiration of Applied Water - Managed Wetlands		-		0.1		-		0.1		-		0.1	PSA/DAU
c		Evapotranspiration of Applied Water - Urban		-		91.6		-		102.2		-		94.4	PSA/DAU
48		Evaporation and Evapotranspiration from Urban Wastewater		-		-		-		-		-		-	REGION
49		Return Flows Evaporation and Evapotranspiration - Ag		-		2.2		-		4.3		-		4.9	PSA/DAU
50		Urban Waste Water Produced	43.0				50.2				46.3				REGION
51a		Conveyance Evaporation and Evapotranspiration - Urban		-		8.6		-		9.6		-		9.4	PSA/DAU
b		Conveyance Evaporation and Evapotranspiration - Ag		-		11.8		-		14.5		-		16.5	PSA/DAU
c		Conveyance Evaporation and Evapotranspiration - Managed Wetlands		-		-		-		-		-		-	PSA/DAU
d		Conveyance Loss to Mexico		-		-		-		-		-		-	PSA/DAU
52a		Return Flows to Salt Sink - Ag		-		32.4		-		45.2		-		50.0	PSA/DAU
b		Return Flows to Salt Sink - Urban		-		98.0		-		108.1		-		105.5	PSA/DAU
c		Return Flows to Salt Sink - Wetlands		-		-		-		-		-		-	PSA/DAU
53		Remaining Natural Runoff - Flows to Salt Sink		-		173.5		-		94.7		-		48.5	REGION
54a		Outflow to Nevada		-		-		-		-		-		-	REGION
b		Outflow to Oregon		-		-		-		-		-		-	REGION
c		Outflow to Mexico		-		-		-		-		-		-	REGION
55		Regional Imports	107.9				143.7				180.0				REGION
56		Regional Exports	65.8				88.9				132.7				REGION
59		Groundwater Net Change in Storage	-639.1				-767.3				-868.7				REGION
60		Surface Water Net Change in Storage	401.0				8.3				-14.0				REGION
61		Surface Water Total Available Storage	1,226.8				1,226.8				1,226.8				REGION

Colored spaces are where data belongs.

N/A - Data Not Available

"- " - Data Not Applicable

"0" - Null value

Table 4-3
Central Coast Hydrologic Region Water Use and Distribution of Dedicated Supplied

	1998			2000			2001		
	Applied Water Use	Net Water Use	Depletion	Applied Water Use	Net Water Use	Depletion	Applied Water Use	Net Water Use	Depletion
WATER USE									
Urban									
Large Landscape	12.0			12.6			13.6		
Commercial	48.4			54.0			46.3		
Industrial	26.0			22.5			20.9		
Energy Production	14.3			14.3			14.3		
Residential - Interior	88.6			106.9			102.6		
Residential - Exterior	87.2			98.2			89.8		
Evapotranspiration of Applied Water		91.6	91.6		102.2	102.2		94.4	94.4
Irrecoverable Losses		21.5	21.5		23.6	23.6		22.7	22.7
Outflow		81.2	81.2		89.9	89.9		87.8	87.8
Conveyance Losses - Applied Water	3.9			4.2			4.4		
Conveyance Losses - Evaporation		3.9	3.9		4.2	4.2		4.4	4.4
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.0	0.0		0.0	0.0
GW Recharge Applied Water	0.0			0.0			0.0		
GW Recharge Evap + Evapotranspiration		0.0	0.0		0.0	0.0		0.0	0.0
Total Urban Use	280.4	198.1	198.1	312.7	219.9	219.9	291.9	209.3	209.3
Agriculture									
On-Farm Applied Water	822.7			994.8			1,146.4		
Evapotranspiration of Applied Water		580.8	580.8		695.7	695.7		789.1	789.1
Irrecoverable Losses		3.2	3.2		4.3	4.3		4.9	4.9
Outflow		32.4	32.4		44.4	44.4		49.2	49.2
Conveyance Losses - Applied Water	12.7			16.5			18.3		
Conveyance Losses - Evaporation		11.8	11.8		14.5	14.5		16.5	16.5
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.8	0.8		0.8	0.8
GW Recharge Applied Water	0.0			0.0			0.0		
GW Recharge Evap + Evapotranspiration		0.0	0.0		0.0	0.0		0.0	0.0
Total Agricultural Use	835.4	628.2	628.2	1,011.3	759.7	759.7	1,164.7	860.5	860.5
Environmental									
Instream									
Applied Water	20.2			21.4			10.8		
Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Wild & Scenic									
Applied Water	318.6			103.2			72.9		
Outflow		173.5	173.5		94.7	94.7		48.5	48.5
Required Delta Outflow									
Applied Water	0.0			0.0			0.0		
Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Managed Wetlands									
Habitat Applied Water	0.1			0.1			0.1		
Evapotranspiration of Applied Water		0.1	0.1		0.1	0.1		0.1	0.1
Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Applied Water	0.0			0.0			0.0		
Conveyance Losses - Evaporation		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Total Managed Wetlands Use	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Environmental Use	339.0	173.6	173.6	124.7	94.8	94.8	84.8	48.6	48.6
TOTAL USE AND LOSSES	1,454.7	999.9	999.9	1,448.7	1,074.4	1,074.4	1,541.4	1,118.4	1,118.4
DEDICATED WATER SUPPLIES									
Surface Water									
Local Deliveries	73.1	73.1	73.1	50.4	50.4	50.4	45.4	45.4	45.4
Local Imported Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Colorado River Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CVP Base and Project Deliveries	18.1	18.1	18.1	51.2	51.2	51.2	55.1	55.1	55.1
Other Federal Deliveries	54.1	54.1	54.1	61.4	61.4	61.4	54.6	54.6	54.6
SWP Deliveries	24.6	24.6	24.6	30.9	30.9	30.9	27.7	27.7	27.7
Required Environmental Instream Flow	173.4	173.4	173.4	94.7	94.7	94.7	48.4	48.4	48.4
Groundwater									
Net Withdrawal	639.1	639.1	639.1	767.3	767.3	767.3	868.7	868.7	868.7
Artificial Recharge	0.0			0.0			0.0		
Deep Percolation	266.0			318.0			354.2		
Reuse/Recycle									
Reuse Surface Water	188.8			56.3			68.8		
Recycled Water	17.5	17.5	17.5	18.5	18.5	18.5	18.5	18.5	18.5
TOTAL SUPPLIES	1,454.7	999.9	999.9	1,448.7	1,074.4	1,074.4	1,541.4	1,118.4	1,118.4
<i>Balance = Use - Supplies</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>

Figure 4-2
North Coast Hydrologic Region 1998 Flow Diagram
In Thousand Acre-Feet (TAF)

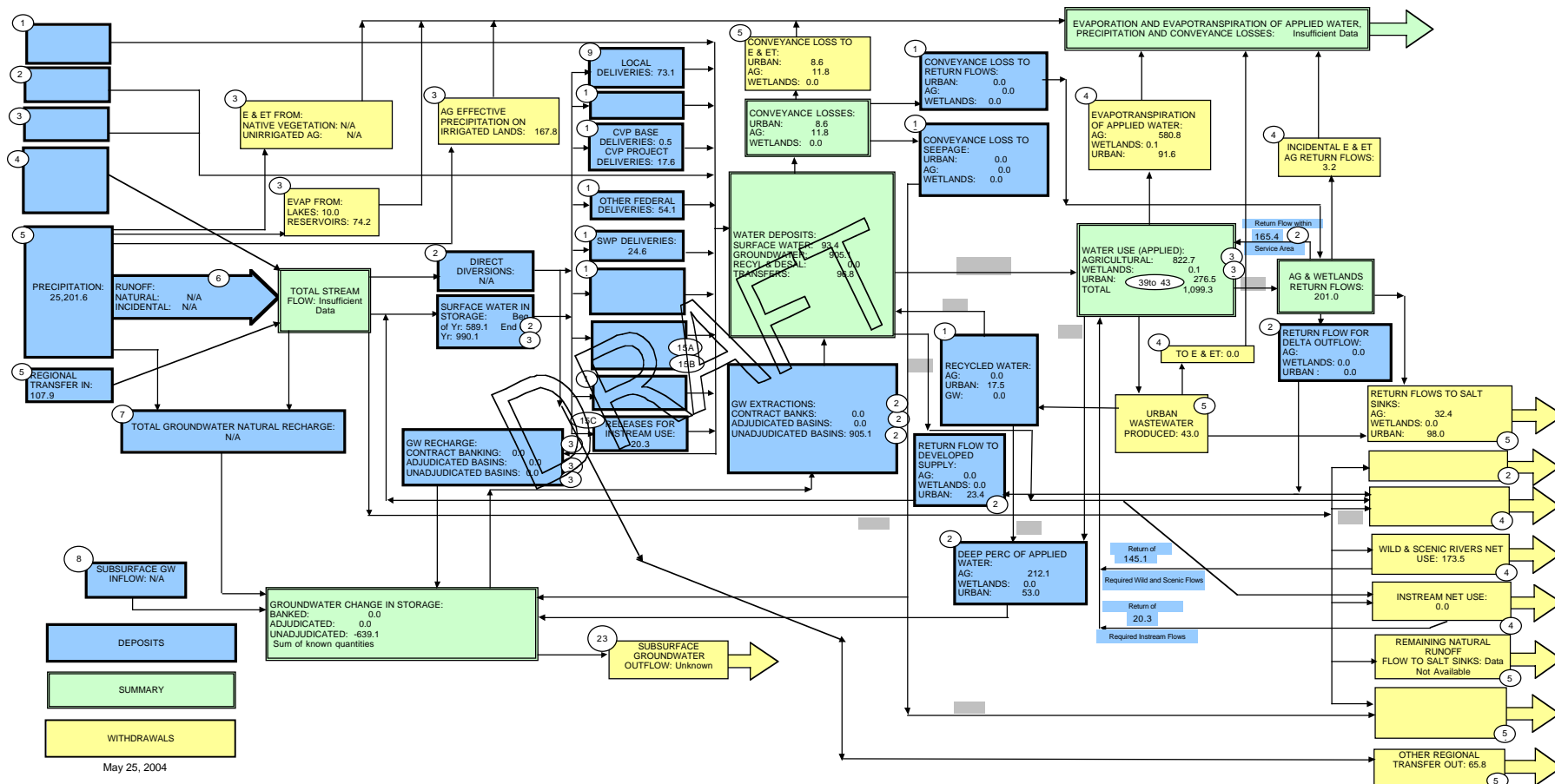
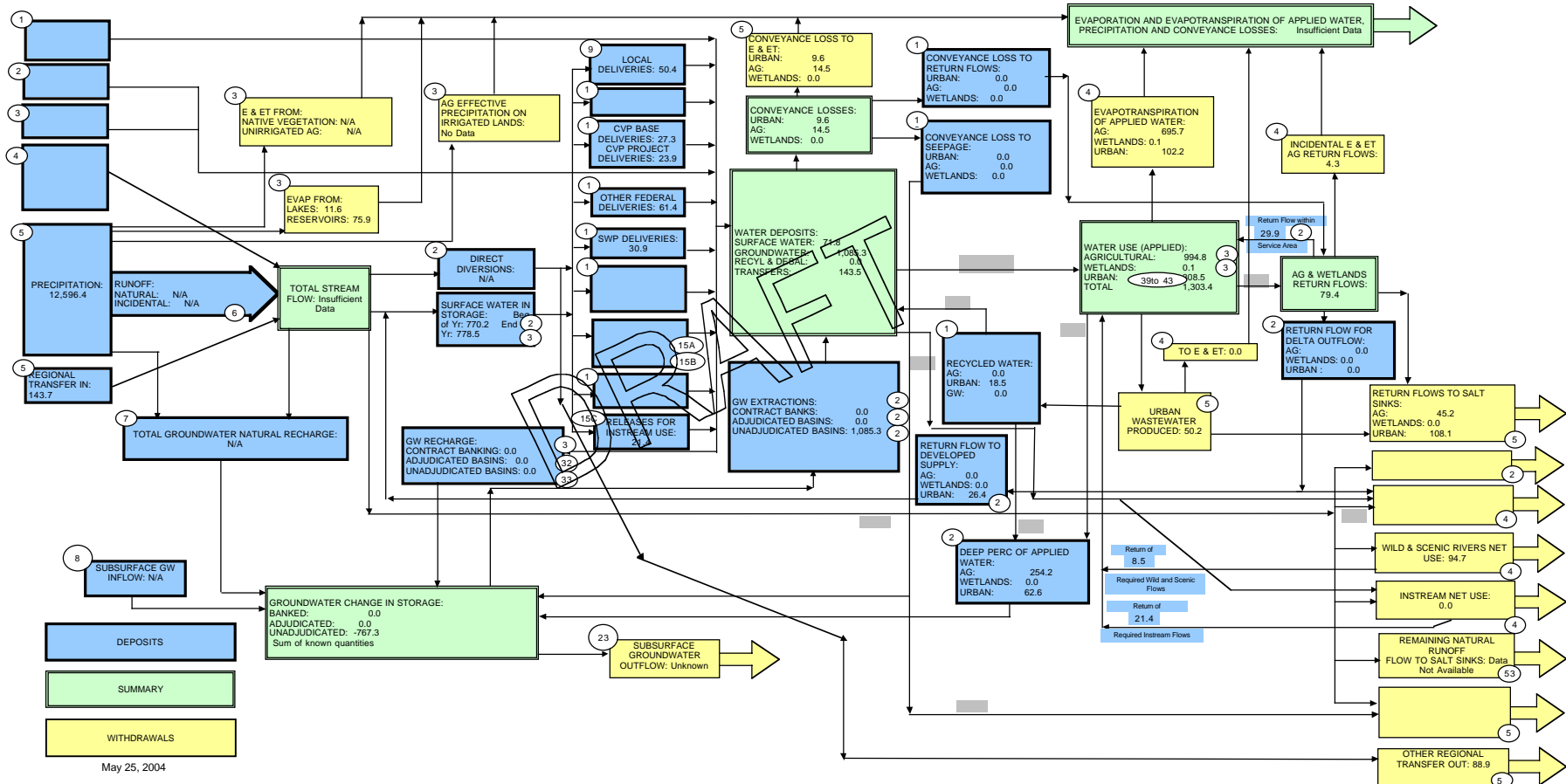


Figure 4-3
Central Coast Hydrologic Region 2000 Flow Diagram



In Thousand Acre-Feet (TAF)

Figure 4-4
Central Coast Hydrologic Region 2001 Flow Diagram
In Thousand Acre-Feet (TAF)

